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09/884,528	06/19/2001	Oleg Wasynczuk	16410-108	2652

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EXAMINER

SHARON, AYAL I

ART UNIT

PAPER NUMBER

2123

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Please find below and/or attached an Office communication concerning this application or proceeding.



## **DETAILED ACTION**

### ***Introduction***

1. Claims 1-13, 16-20, 24-26, and 29-42 of U.S. Application 09/884,528 are currently pending.
2. The application was originally filed on 6/19/2001. The application claims priority to provisional application 60/212,695, filed on 6/19/2000.
3. Claims 1, 9, and 39-40 have been amended. Claims 27-28 have been cancelled, and claims 43-44 have been added.

### ***Continued Examination Under 37 CFR 1.114***

4. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/20/2006 has been entered.

### ***Information Disclosure Statement***

5. Examiner thanks the Applicants for resubmitting the missing pages of the IDS originally filed on 8/27/2001.

6. In the Amendments filed on 4/18/2005 and 1/30/06, the Applicants refer to an article titled "Distributed Simulation" from Aerospace Engineering, Nov. 2004. The amendment states (see p.16, paragraph 2) that the article was "submitted herewith", however, the Article was not received.
7. Examiner again requests a copy of this article.
8. Examiner also requests a copy of the *Technology Horizons* article cited by the Applicants in p.21 of the Amendment filed 1/30/06.

***Allowable Subject Matter***

9. Claims 16-18 and 34-35 have not been rejected based on prior art. They would be allowable if rewritten in independent form including all of the limitations of the base claim and all intervening claims, and if all rejections of the independent claims (including 35 U.S.C. §101 rejections) were overcome.
10. The following statements are reasons for the indication of allowable subject matter.
11. None of the cited prior art references expressly teach the unique combination of sets and subsets that is claimed in the limitations of claim 16. Claim 16, however, is rejected under 35 U.S.C. §101.
12. Claims 17-18 and 34-35 depend from claim 16.

***Claim Rejections - 35 USC § 101***

13. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

**14. Claims 1-13, 16-20, and 24-26, 29-42 are rejected under 35 U.S.C. 101**

**because the claimed invention is directed to non-statutory subject matter.**

15. The claims lack a concrete, tangible, and useful result.

16. An invention which is eligible for patenting under 35 U.S.C. § 101 is in the “useful arts” when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result.

17. One may not patent every “substantial practical application” of an idea, law of nature or natural phenomena because such a patent “in practical effect be a patent on the [idea, law of nature or natural phenomena] itself.” Gottschalk v. Benson, 409 U.S. 63, 71-72, 175 USPQ 673, 676 (1972).

18. Moreover, whether a claim recites a machine implemented process is not determinative of whether that process claim is statutory. Thus, a claim that is nothing more than a machine-implemented abstract idea is not statutory. See Benson, 409 U.S. 63, 175 USPQ 673 (finding machine-implemented method of converting binary-coded decimal numbers into pure binary numbers unpatentable).

19. The fundamental test for patent eligibility is to determine whether the claimed invention produces a “**useful, concrete and tangible result.**” See State Street Bank & Trust Co. v. Signature Financial Group Inc., 149 F. 3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998) and AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 50 USPQ2d 1447 (Fed. Cir. 1999). In these decisions, the court found that

the claimed invention as a whole must accomplish a practical application. That is, it must produce a “useful, concrete and tangible result.”

20. See State Street, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02. (“[T]he transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces ‘a useful, concrete and tangible result’ – a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades”).

21. See also AT&T, 172 F.3d at 1358, 50 USPQ2d at 1452 (Claims drawn to a long-distance telephone billing process containing mathematical algorithms were held to be patentable subject matter because the process used the algorithm to produce a useful, concrete, tangible result without preempting other uses of the mathematical principle).

### ***Claim Rejections - 35 USC § 112***

22. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

**23. Claims 1-13, 16-20, 24-26, and 29-38 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in**

such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

24. More specifically, the specification does not describe how the invention implements the claimed limitation of a first process (or subsystem) sending values (or messages) to a second process (or subsystem), without the values or messages "passing through a central communications process".
25. The previous Office Action cited the "DSMO Facility reference". Dr. Wasynczuk's declaration filed 1/20/2006 argues (see para. 11-12) that the claimed invention differs from the DSMO Facility Reference because the prior art teaches a "central communication process" that is unlike the "peer to peer" data passing in the claimed invention. However, this the "peer to peer" functionality is not described in the specification at all, much less at the level that one of ordinary skill in the art at the time the application was filed would have known how to make without undue experimentation.
26. Examiner also notes that the DSMO Facility reference expressly teaches the use of Common Object Request Broker Architecture (CORBA). (See pp.16-17, "Section 0.8" of the DSMO Facility reference). The previous Office Action also cited the OMG CORBA Reference, which expressly teaches the following (See the section titled "What is CORBA? What Does it Do?"):

Using the standard protocol IIOP, a CORBA-based program from any vendor, on almost any computer, operating system, programming language, and network, can interoperate with a CORBA-based program from the same or another vendor, on almost any other computer, operating system, programming language, and network.

27. However, Examiner also notes that the OMG CORBA reference teaches the use of an Object Request Broker (ORB) – See Fig.1 of the reference. This reference also teaches the use of an “ORB/Skeleton Architecture on the Server Side.”

Given the breadth of the term “central communication process”, it is unclear as to whether the decentralized CORBA methodology, which uses Object Request Brokers (ORBs), is covered by this limitation.

28. If CORBA corresponds to Applicants’ claimed “central communication process”, then the lack of description in specification, as well as the lack of description of this functionality in the cited prior art would have imposed a burden of undue experimentation on one of ordinary skill in the art at the time the invention was claimed to implement the feature of communicating between two simulators without the values or messages “passing through a central communications process”.

29. In regards to the amended limitation being a negative limitation, this rejection conforms to MPEP § 2173.05(i).

30. **Claims 30-31 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.



31. More specifically, the specification does not teach the features of the “resistor companion model” claimed in claim 30, nor the “numerical integration techniques” claimed in claim 31.

32. **Claims 39-44 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

33. More specifically, the claimed limitations of “a speed greater than  $O(n)$  times the speed of the simulation using a single one of the computing devices”, or for “ $O(n^2)$ ” or “ $O(n^3)$ ” are not described in the specification. Moreover, no evidence is presented that the claimed inventions actually meet these performance levels. The cited prior art does not provide support for such claims either. One of ordinary skill in the art would not have known how to make the claimed invention to match these claimed performance values.

34. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

35. **Claims 39-44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.** The claims are indefinite because by claiming a speed that is “ $O(n^2)$  times the speed” or “ $O(n^3)$  times the

speed" of the prior art, it appears that the Applicants are claiming an invention that is orders of magnitude slower than the prior art.

***Claim Rejections - 35 USC § 103***

36. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

37. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

38. The prior art used for these rejections is:

- a. Defense Modeling and Simulation Office (DMSO), "Facility for Distributed Simulation Systems: Proposed Request for Comments". Version 1.2. June 1998. Chapters 1, 8. (**"DMSO Facility reference"**).

b. Object Management Group. "CORBA BASICS®". ©1997-2004.

<http://www.omg.org/gettingstarted/corbafaq.htm>. Printed 11/12/2004.

("OMG CORBA Reference").

39. The prior art was originally cited in PTO-892 form dated 11/17/2004.

40. The claim rejections are hereby summarized for Applicants' convenience. The detailed rejections follow.

**41. Claims 1-13, 19-20, 25-26, 29, 32-33 and 39-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over DMSO Facility reference in view of OMG CORBA Reference.**

42. In regards to independent claim 1, the DSMO Facility reference teaches the following limitations:

1. *(Currently Amended) A computer-implemented system, comprising:  
a first executing process that:  
    implements a first continuous-time model to simulate a first subsystem, the first model being programmed in a first language and having a first state variable;  
    and  
    sends a first series of state-related numerical values, each numerical value reflecting information relating to the value of the first state variable at a different point  $t_m$  in simulation time in the first model; and  
a second executing process that:  
    receives said first series of state-related numerical values ... and  
    implements a second continuous-time model to simulate a second subsystem, the second model being programmed in a second language and taking as an input values from said first series of state-related numerical values; and  
    outputs data representative of a state of the second continuous-time model.*

(See especially "Section 1. Overview" in pp.25-27 of the DSMO Facility reference.)

However, while the DSMO Facility reference expressly teaches the use of CORBA (see pp.16-17, "Section 0.8"), the DSMO Facility reference does not expressly teach the following limitation:

*receives said first series of state-related numerical values from said first executing process without said first series of state-related numerical values passing through a central communication process; and*

The OMG CORBA Reference, on the other hand, expressly teaches the following

(See the section titled "What is CORBA? What Does it Do?"):

Using the standard protocol IIOP, a CORBA-based program from any vendor, on almost any computer, operating system, programming language, and network, can interoperate with a CORBA-based program from the same or another vendor, on almost any other computer, operating system, programming language, and network.

Examiner also notes that the OMG CORBA reference teaches the use of an Object Request Broker (ORB). (See Fig.1 of OMG CORBA). Examiner interprets that CORBA is decentralized, and therefore does not correspond to the claimed "central communication process".

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of DMSO Reference with those of OMG CORBA, because DMSO Expressly teaches the use of CORBA (see pp.16-17, "Section 0.8" of DMSO Facility reference).

43. In regards to dependant Claims 2-8 they are rejected on the same grounds as Claim 1.

44. In regards to independent Claim 9, and its dependent Claims 10-13, 19-20, 25-26, and 29-33 they are rejected on the same grounds as Claim 1.

45. In regards to Claim 39, the following limitations are rejected on the same grounds as presented in regards to Claim 1:

39. (Currently Amended) A computer-implemented system for simulating a physical system, the physical system comprising two or more subsystems, the computing system

*comprising a plurality  $n$  of computing devices, each simulating a subsystem of the physical system, wherein:*

*at least one subsystem is simulated by computationally solving a system of ordinary differential equations;*

*each subsystem simulation either*

*provides a series of output messages to another subsystem simulation, where the output messages encode state-related data from the subsystem, or*

*receives a series of input messages from another subsystem simulation, where the input messages encode state-related data from the other subsystem simulation, or*

*both provides a series of output messages to another subsystem simulation, where the output messages encode state-related data from the subsystem, and receives a series of input messages from another subsystem simulation, where the input messages encode state-related data from the other subsystem simulation; and*

*the computing system provides an output signal from at least one of the subsystem simulations;*

On the other hand, the cited prior art does not expressly teach the following limitations:

*wherein the simulation of the physical system occurs with a speed greater than  $O(n)$  times the speed of the simulation using a single one of the computing devices.*

Examiner finds this limitation to be inherent to all distributed multi-processor computing systems.

46. In regards to Claim 40, the following limitations are rejected on the same grounds as presented in regards to Claim 1:

*40. (Currently Amended) In a computer-implemented distributed simulation of a physical system, the improvement comprising: running a continuous-time simulation of the physical system in a set of  $n$  computing devices;  $i$  and*

*outputting data representative of a state of the physical system simulation; wherein the running occurs with a speed greater than  $O(n)$  times the speed of the simulation using a single one of the computing devices.*

Examiner finds the "speed greater than  $O(n)$  ... using a single one of the computing devices" limitation to be inherent to all distributed multi-processor computing systems.

Art Unit: 2123

47. Claims 41-44 are rejected on the same grounds as claim 40.

**48. Claims 24 and 36-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over DMSO Facility reference in view of OMG CORBA Reference, and further in view of Official Notice.**

49. In regards to Claim 24,

*24. (Previously Presented) The method of claim 20, wherein said displaying comprises graphing a function of the first state-related variable versus an independent variable.*

While the cited prior art does not expressly teach graphing, Official Notice is given that it was old and well known at the time of the invention to graph data. It would have been obvious to one of ordinary skill in the art at the time the invention was made to graph data because visually represented information is more easily understood.

50. In regards to Claim 36,

*36. (Previously Presented) The system of claim 24, wherein the independent variable is time.*

While the cited prior art does not expressly teach graphing, Official Notice is given that it was old and well known at the time of the invention to graph data versus time. It would have been obvious to one of ordinary skill in the art at the time the invention was made to graph data because visually represented information is more easily understood.

51. Claims 37-38 are rejected on the same grounds as claim 36.

***Response to Arguments***

***Re: Claim Rejections - 35 USC § 101***

52. The previously applied 35 USC § 101 rejections have been withdrawn. New 35 USC § 101 rejections have been applied. These new rejections are based on the lack of a concrete, useful, tangible result.

***Re: Claim Rejections - 35 USC § 112***

53. Examiner has withdrawn the previously applied 35 USC § 112 rejections based on Applicants' arguments. Examiner has applied new rejections as necessitated by Applicants' amendments and declaration.

***Re: Claim Rejections - 35 USC § 102***

54. Examiner has found Applicants' arguments regarding the Liu reference to be persuasive (see p.16 of the amendment filed 1/30/06). All rejections based on the Liu reference have been withdrawn.

55. In addition, Examiner is withdrawing the rejections of claims 40-42 based on the Bain reference, because Bain teaches discrete event simulation, while the claims of the instant application are directed to continuous-time simulation. (See pp.16-18 of the amendment filed 1/30/06).

Re: Claim Rejections - 35 USC § 103

56. Examiner has withdrawn all § 102 and § 103 rejections based on the Liu and Bain references, as described above.

Re: Wasynczuk Declaration

57. Dr. Wasynczuk argues that the claimed invention differs from the DSMO Facility Reference because the prior art teaches a “central communication process” that is unlike the “peer to peer” data passing in the claimed invention. (See para. 11-12 of Dr. Wasynczuk’s declaration filed 1/20/2006).

58. Examiner notes that p.20 of the DSMO Facility reference corresponds to Exhibit A of Dr. Wasynczuk’s declaration.

59. Examiner also notes that pp.16-17 of the DSMO Facility reference (Section 0.8) expressly teach the use of CORBA.

60. Examiner also notes that the OMG CORBA Reference expressly teaches the following (See the section titled “What is CORBA? What Does it Do?”):

Using the standard protocol IIOP, a CORBA-based program from any vendor, on almost any computer, operating system, programming language, and network, can interoperate with a CORBA-based program from the same or another vendor, on almost any other computer, operating system, programming language, and network.

61. Examiner also notes that the OMG CORBA reference teaches the use of an Object Request Broker (ORB) – See Fig.1 of the reference. Examiner cannot determine from Applicants’ disclosure the scope of the amended limitation “central



communication process", and more specifically, whether it applies to CORBA or not.

62. Examiner has also applied 35 U.S.C. § 112 rejections based on the lack of enablement of the claimed lack of use of a "central communication process."

**Re: Krause Declaration**

63. Examiner acknowledges Dr. Krause's Declaration, which provides evidence of commercial success. However, the claims are not currently in condition for allowance.

***Conclusion***

64. In light of Dr. Krause's Declaration dated 1/20/06, Examiner has cited on the PTO-892 form a copy of the description of PCKA DHS product as described on the PCKA website. The printout is dated 3/23/06.

***Correspondence Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a biweek, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached at (571) 272-3753.

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Art Unit: 2123

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon  
Art Unit 2123  
March 29, 2006

  
Paul L. Rodriguez  
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Art Unit 2125 2123 3/30/06